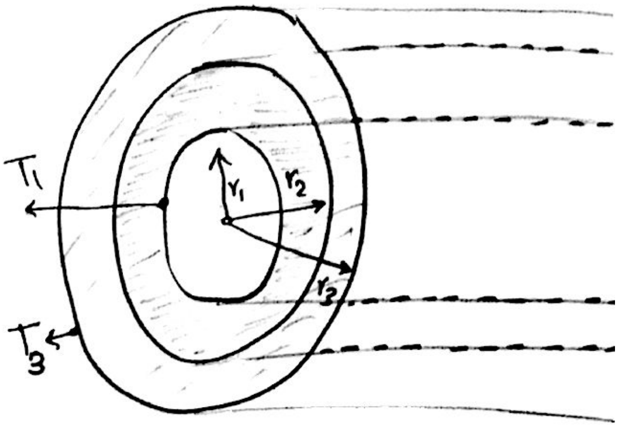
sheet . 1

No. 8 Insulated steam pipe.



Pipe out side diameter $oD = 3\ cm$

Two layers of insulation

$\delta_1 = \delta_2 = 2.5\ cm.$

Let $k_2 = 5\ k_1$

$*\quad \Delta T = T_1 - T_3 \Rightarrow$ Fixed.

$r_1 = 1.5\ cm$

$r_2 = 4\ cm$

$r_3 = 6.5\ cm$

Solution

Case $\boxed{1}$

The better material (k_1) is outer layer.

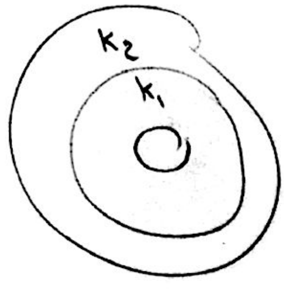
$$\dot{Q}_1 = \frac{\Delta T}{\dfrac{\ln(r_2/r_1)}{2\pi k_2 L} + \dfrac{\ln(r_3/r_2)}{2\pi k_1 L}}$$

$r_2 = 4$, $r_1 = 1.5$, $r_3 = 6.5$, $r_2 = 4$, $k_2 = 5k_1$

$$\therefore \dot{Q}_1 = \square * L * k_1 * \Delta T \longrightarrow eq\boxed{1}$$

Case $\boxed{2}$

The better material (k_2) is next to the pipe.



$$\dot{Q}_2 = \frac{\Delta T}{\dfrac{\ln(r_2/r_1)}{2\pi k_1 L} + \dfrac{\ln(r_3/r_2)}{2\pi k_2 L}}$$

$r_2 = 4$, $r_1 = 1.5$, $r_3 = 6.5$, $r_2 = 4$, $k_2 = 5k_1$

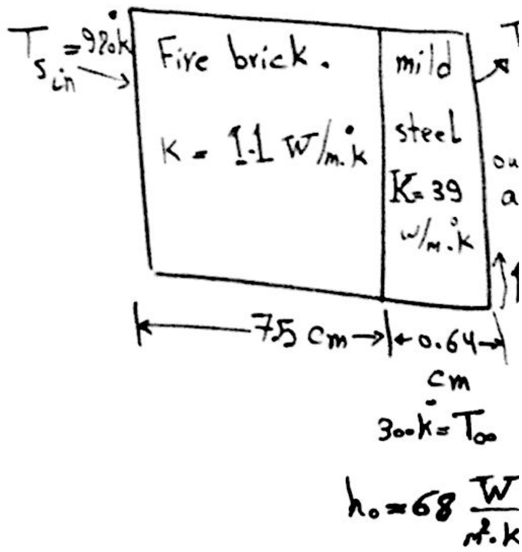
$$\therefore \dot{Q}_2 = \square * L * k_1 * \Delta T \longrightarrow eq\boxed{2}$$

$$\%\ \text{Reduction} = \frac{\dot{Q}_1 - \dot{Q}_2}{\dot{Q}_1} * 100 = \checkmark\checkmark$$

d

sheet . 1

No - 12



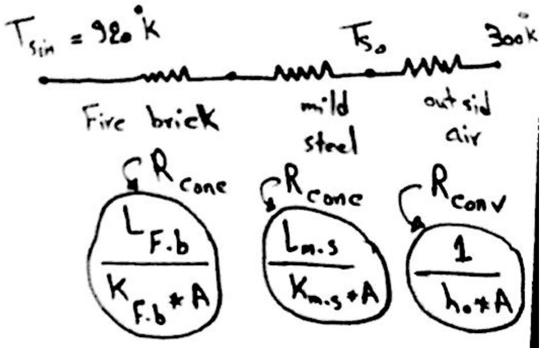
Required:

[1] $q^\circ = \frac{Q^\circ}{A} = ?!\ \frac{W}{m^2}$?

[2] $T_{s_o} = ?!\ ^\circ C$

Solution

$$q^\circ = \frac{Q^\circ}{A} = \frac{A \cdot \Delta T}{R_{th}}$$



$$q^\circ = \frac{920 - 300}{\frac{0.075}{1.1} + \frac{0.0064}{39} + \frac{1}{68}} = \surd\surd$$

For steady Flow of H.T.

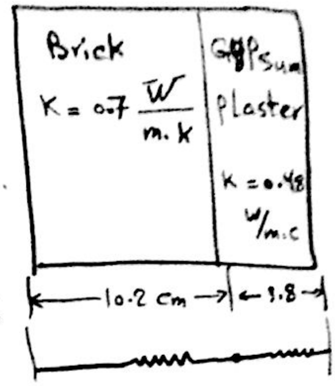
$$q^\circ_1 = q^\circ_2$$

$$\surd\surd = \frac{920 - T_{s_o}}{\frac{0.075}{1.1} + \frac{0.0064}{39}}$$

$\therefore T_{s_{out}} = \surd\surd\ ^\circ K$

sheet.1

No. 10



Case 1

$$\boxed{\dot{Q}_2 = 25\,\dot{Q}_1}$$

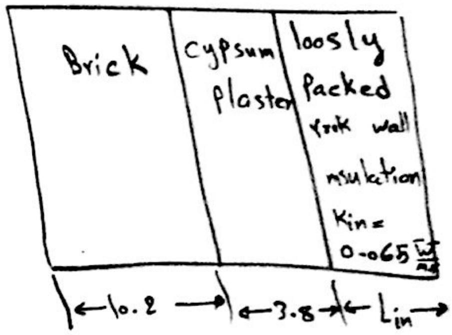
reduce H.T by 75% or to 75%

$$\dot{Q}_2 = \frac{\Delta T}{\frac{0.102}{0.7 * A} + \frac{0.038}{0.48 * A} + \frac{L_{in}}{0.065 * A}}$$

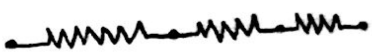
$$= \frac{25}{100} * \frac{\Delta T}{\frac{0.102}{0.7 * A} + \frac{0.038}{0.48 * A}}$$

For the same $(\Delta T$ & $A)$.

$\therefore L_{in} =$



Case 2



b

$$\dot{Q}_{conv} = h A \Delta T$$

$$\dot{Q} = \frac{\Delta T}{R_{th}} \longrightarrow \therefore \boxed{R_{th})_{conv} = \frac{1}{hA}} .$$

R_{th}

- $R_{th})_{conduction}$
  - Plan wall. $\boxed{\frac{L}{KA}}$
  - cylindrical wall. $\boxed{\frac{\ln r_o/r_i}{2\pi K L}}$
  - spherical wall. $\boxed{\frac{r_o - r_i}{4\pi K * r_i * r_o}}$
- $\boxed{\left(\frac{1}{hA}\right)}$ R_{th}, convection

د اثباتهم علينا

2/3/2016

سكشن [2] انتقال حرارة

AMR
M.r

9

Heat Transfer (1)

Modes of Heat transfer

Convection Heat transfer.

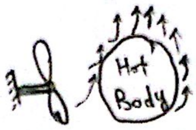
- Free (Natural).
- Forced
- Mixed

Buoyancy Force قوى الطفو.

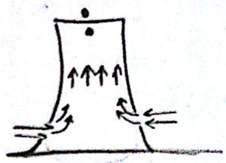
$\rightarrow \Delta \rho$

$\downarrow$

ΔT



using on external means such an a fan or pump.



chimny smoker.

$$\dot{Q}_{conv} = h A \Delta T \Rightarrow \text{Newton's law of cooling}$$

h = unit $(W/m^2 \cdot {}^\circ C)$ "k" unit $(W/m \cdot {}^\circ C)$.

"h" = convection H.T. coefficient.